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ABSTRACT

This newsletter is concerned with energy education programs for the general public. The nature of the target audience is analyzed first, then the discussion turns to the questions of what goals may be set for such programs and what vehicles or agencies may be used. Four new curriculum project materials are reviewed and descriptions of nine publications appropriate for courses on energy are cited. Announcements of publications on energy and energy sources, of workshops and conferences, of a radio program concerned with the energy crisis, and of films on energy complete the newsletter. (DT)

SCIENCE EDUCATION NEWS

American Association for the Advancement of Science

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May 1974

Energy Education

ED 093697

The recent blossoming of the energy crisis has resulted in numerous conferences and articles devoted to an analysis of the causes and effects of our present energy situation and of the options for the future. In order for the public to be informed of the many facets of the energy crisis, the wealth of material being written on the subject must be synthesized into educational packages suitable for all levels of formal and informal education. This issue of *Science Education News* describes a number of such educational units.

Many of the national curriculum projects in elementary, secondary, and higher education contain materials and activities related to energy and the present energy crisis. For this issue of *Science Education News* it was not possible to list these items, but anyone interested in developing a course on energy should investigate the curriculum projects for the appropriate grade levels.

In the introductory article, "Energy Education: The Cheapest Source of Energy," Rustum Roy describes a new source of energy, non-use-of-energy or NOU-energy. Through a most provocative argument, Dr. Roy concludes that the goal of energy education should be to develop NOU-energy resources.—D. I. P.

Energy Education: The Cheapest Source of Energy

Education—For Whom?

In this article I will be concerned solely with education programs for the general U.S. public—what goals may be set for such programs and what vehicles utilized. But first one must focus on the nature of the audience since many education programs go astray by not keeping firmly fixed on the target audience. The level of the U.S. public's understanding of science and its impact on our national life is perfectly illustrated by the public's response to the energy crisis. Indeed, any energy-education program could well start with what we have long advocated—a national survey of public information and attitude on basic questions such as what the general public knows, and what its attitudes are, about every energy issue from radioactive waste to smaller automobiles. Contrary to writings by social critics such as Mumford or Roszak, and typified by a recent statement in *Science*,[1] the *attitude* of the general American public toward science, as measured by national surveys of the public, shows little sign of disaffection. Such recent surveys show that "medicine" and "science" are more believed in than any similar institution in the country. But that is the end of the good news. Unfortunately for us, these positive attitudes toward science and technology are not founded on information or understanding. The positive attitudes probably result from the emotional relocation of certain philosophical-religious values, principally hope and "salvation," away from abstract and distant interpretations of "God" into concrete and demonstratively effective (at first sight) cures and comforts which the "god" of science and technology provides.

Most American citizens can accurately be described as tourists in their own culture, diplomats living comfortably in a foreign land—the world dominated by science and technology.

What then can one realistically hope to achieve in energy education of such cultural tourists, ignorant of, but friendly toward "science"? What would one want to communicate? and what means are likely to have modest or limited success? It is simply absurd to attempt to provide the general public with cognitive, informational material to help people make intelligent, informed choices on the relative merits of nuclear energy versus coal. Such efforts are likely to be, indeed have become, counter-productive. The public reaction to a surfeit of detail, claim and counterclaim, or the carefully hedged-about statements of responsible scientists, is merely to increase its distrust of "authority." Furthermore, the same discussions of alternative technical strategies, of mixes of new technologies to meet the nation's energy needs, also tends to reinforce the dangerous view that man has an infinity of "technofixes" available—which will sooner or later be applied to permit the individual to do exactly as he wishes, with minimum discomfort or change in ways, and with lower taxes to boot.

[1] "The past may give some hints on how to survive the most recent recurrence of public hostility to science." S. G. Brush, *Science* 183, 1164 (1974).

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What Is to Be Communicated?
Education—A New Source of Energy!

Energy education is destined to become one more catchword struggling valiantly to maintain its place in the sun against the next or the last other crisis, unless . . . Unless one can show that this new style of education could easily be the most cost-effective part of the Federal programs searching for new sources of energy. I believe that with a very modest (compared to the billions to be spent altogether) program of say several tens of millions of dollars a year, the country could get the most immediate return on its money and provide the only absolutely pollution-free, infinitely available, source of energy. This part of our energy supply is called "NOU"-energy, shortened from n[o]-use-of-energy. Thus, with a very modest R & D effor[t] we could probably meet 20 percent of the nation's needs in 1985 and 45 percent in 2000 using the Ford Foundation's energy project data and the difference between their first and third scenarios.[1]

I am proposing in utter seriousness, therefore, that energy education have a single-minded goal: that of developing this ideal source of energy, NOU-energy. Surely if the country is prepared to spend hundreds of millions of dollars on each of geothermal and solar energy, to say nothing of billions for fusion and LMFBR's, not one of which has the potential of NOU-energy, it is not unreasonable to put equivalent sums into energy education *for this purpose*. This is, I [th]ink, the only meaningful way to go about energy education.

Thus I have stated the goal of meaningful energy education: Develop NOU-energy resources. One can divide the task up as follows:

a) *De-escalate expectations of the population.* Start getting across the basic concepts of **limits**, and resource-finitude and human-finitude; that not all of everyone's wants can or will be supplied; that technology is not a magic genie, but a thermodynamic Mephistopheles.

b) *Advocate collective and individual conservation.* It is more blessed to save than to spend. Much of the education should focus on what "each one can do for his country" not the other way around. Motivational education should be stressed.

c) *Restore meaning of legitimate authority of knowledge.* A key item is the understanding and acceptance (after all appropriate due process and safeguards have been guaranteed) of the importance of the exercise of human judgment based on the best information at the time. Energy policy in the U.S. will be fragmented and stymied unless the level of trust is restored. This can be done with some quite new institutional innovations in the decision process, and of course by placing persons of the highest integrity in the position of authority.

d) *Describe options, show tradeoffs.* Broad-scale options such as the Ford energy project's three scenarios are all the public can possibly absorb. They are essential to seeing the role of NOU-energy in the total picture.

What Vehicles or Agencies?

I believe it would be a mistake to operate through new vehicles and institutions. Instead the most effective means would be to fund all the opinion-forming agencies—newspapers, TV, radio—and especially all the motivating agencies—schools, service clubs, and churches—to get across the message of the last paragraph in all the diverse and innovative ways that they may invent.

Has any kind of education ever paid its way? Here in the discovery, development, and marketing of NOU-energy to compete with the development of all other energy sources, education may have the first opportunity to prove itself as a genuine vehicle for public policy—RUSTUM ROY, *Materials Research Laboratory, The Pennsylvania State University, University Park, Pennsylvania 16802.*

[1] *Exploring Energy Choices.* A Preliminary Report, Energy Policy Project of the Ford Foundation. The Energy Policy Project, P. O. Box 23212, Washington, D.C. 20024.

New Curriculum Project Materials

Teaching Aid from Metropolitan Life

The Metropolitan Life Insurance Company asked a panel of national leaders how Metropolitan Life could help improve the environment. The answer was "Through education." In response to this answer, the Health and Welfare Division of Metropolitan Life has just introduced a new multimedia teaching aid, "Exploring Your Environmental Choices." The announcement of the new teaching aid was made by Dr. Claude M. Eberhart, medical director and head of the Health and Welfare Division. He said, "The new teaching aid makes use of an inquiry- and decision-making approach, widely used in education today, to help students in grades 7 through 12 think through complex questions. It can help them make informed rational decisions and, while drawing from their own personal experiences, teach them how to consider the viewpoints of others objectively."

In the program students explore their relationship with natural and man-made surroundings and deal with such subjects as pollution, resource allocation and depletion, conservation, transportation, population, technology, and urban and rural planning. The program concentrates on helping students to learn how to think on the subject. The materials pose many environmental issues and suggest a wide range of viewpoints and trade-offs to consider. Students examine their personal priorities and make their own decisions based on information they obtain.

The materials contained in the kit include a tape with comments, interviews, and dramatizations; a set of nine transparencies to stimulate interest and discussion by the students; an inquiry- and decision-making model; and a guide for teachers and group discussion leaders with suggestions for using the other components. The

kit also includes a family participation guide with suggested topics and activities so that a student can involve his parents and others in discussions of environmental problems. These materials underwent extensive testing in classrooms across the country prior to their official introduction. The feedback from educators, scientists, and students has been enthusiastic.

The package is available from Metropolitan Life for $18.50, considerably below cost. For information on "Exploring Your Environmental Choices," contact Health and Welfare, Metropolitan Life Insurance Company, One Madison Avenue, New York, N.Y. 10010.

Energy Units in Topeka Schools

In 1971 the Topeka public and parochial schools began the Environmental Education Demonstration Project with Title III funds. By the end of the 1973-74 school year, the final year of federal funding, ten units will have been developed for special education classes, seven units for the elementary grades, eight units for science classes in the secondary grades, and one unit for a seventh-grade social studies class.

A Community Council consisting of students, parents, educators, and interested lay citizens serves as an advisory group for all project planning and implementation activities. The council is also responsible for helping recruit community volunteers to help with project activities.

The project's goal was to create in every student an emotional and intellectual appreciation of man's role within his environment. To accomplish this goal, the units were built around three broad topics: planning for increased population; pollution; and balance of nature. All units were field tested and evaluated with pretest and posttest instruments. They include behavioral objectives, classroom activities, and a field trip. Three of the units are concerned with energy.

Energy and You is the name of a unit for special education classes. The unit presents information regarding energy problems for Level II and III educable mentally retarded students. There are four topics: 1) What Is Energy? 2) Energy Fuels, 3) How We Use Energy, and 4) Conservation of Energy.

Energy is a unit which is intended to provide upper elementary students with basic information about: 1) what energy is, 2) where it comes from, 3) how we use it, and 4) ways we can more wisely use the energy available to us. After completing the unit students should be well aware that any life style is closely related to the amount of energy available and consumed. As part of the unit, students visit displays in the State Historical Society Building where they can compare energy with various life styles.

For eighth-grade science students there is the unit *Electrical Production and Pollution Control*. This unit focuses on practical and applied electrical problems, production processes for electricity, the energy crisis in the U.S., pollution control (air, solid waste, and noise), and related scientific experiments.

A major responsibility of the project staff is to disseminate information concerning the successes and failures of the project to interested school systems and persons throughout the nation. For further information and/or visitation plans, contact the Director of Public Information Services, 415 West Eighth Street, Topeka, Kansas 66603.

Science, Technology and Society Modules

Since the summer of 1972 the AAAS Office of Science Education has been engaged in a cooperative project to prepare modular study guides on various topics in the area of science, technology, and society. The learning modules are designed to be used by secondary school teachers and students in established courses, whether traditional or nontraditional.

A module contains activities for students and teachers, a teacher's guide, readings for students and suggestions for investigations. Draft modules on "Science, Technology, and Privacy," "Weather Modification," and "Energy and Society" are being tested in selected classrooms during the 1973-74 school year. Several additional modules are being developed. A major concern of the project will be to develop modules that will be useful for students with a wide range of abilities.

The module, "Energy and Society," is organized according to issues and is grouped into four main topic areas: energy use in home, industry, and transportation; economic, political, and social factors related to energy; energy and the environment; and science and technology of energy. Through the many activities suggested in each of the four areas, students and teachers have the opportunity to consider current issues of the energy problem as well as to gain a better understanding of the causes of the problem. Students and teachers also can learn of the basic principals involved in energy production and of the ways in which various energy production systems work.

For more information on this module or the entire project, write the Office of Science Education, American Association for the Advancement of Science, 1776 Massachusetts Avenue, N. W, Washington, D.C. 20036.

Consumers and the Energy Crisis

The Consumer Educator, Vol. 3, No. 4, January 1974, published by the National Association of Secondary School Principals in cooperation with the Council of Better Business Bureaus, Inc., announces the publication of module #10 in the Expanded Programs of Consumer Education series prepared by the State Education Department of the University of the State of New York. The module is entitled *Coping with the Problems of a Technological Age*. It is divided into two parts which describe the kinds of problems that technology poses for the consumer. Among topics covered are the energy crisis, supply of natural resources, problems of repair costs, the matter of wise consumer choice, and the effects of a changing technology on all aspects of life. The module includes suggested class activities and resources. Write to the Bureau of Secondary Curriculum Development, Albany, New York 12224, for information about the series.

More Materials for Courses on Energy

Environmental Resource Packets

John M. Fowler and Kathryn E. Mervine of the Department of Physics and Astronomy, University of Maryland, are preparing a series of "Environmental Resource Packets" under grants from the Exxon Education Foundation and the Environmental Protection Agency. The overall goal of the packets is to encourage college science teachers to become professionally competent in selected environmental areas. The collection, selection, and summaries which go into each packet should make it attractive and possible for teachers to become resource people for their local communities and/or to incorporate substantial environmental materials into their college courses.

By compiling information available on a particular area in a single source booklet, Dr. Fowler and Ms. Mervine have tried to eliminate the library search and extensive first readings that are a barrier for the busy college science teacher. Each packet consists of a review paper (or papers), which introduces and summarizes the field covered by the packet, and a selected and annotated bibliography that makes up the bulk of the presentation. Both the review paper and the bibliography reach beyond the natural sciences and bring in considerations of economics, politics, ethics, and other related fields as they apply. Further, the articles referenced represent all the points of view that are important to the environmental problems with which the packets deal.

The first packet developed was "Energy and the Environment." The review article by Dr. Fowler puts the energy problem into perspective. It is the conversion of energy from its primary sources to its end uses that contributes mightily to the various facets of the energy crisis. We burn to convert, and this causes pollution. We are doomed to low efficiencies by the Second Law of Thermodynamics, and the wasted heat causes thermal pollution.

The bibliography is organized into specific areas of the energy problem. Reference works are listed in areas of energy policy, electric power, nuclear power, fossil fuels, energy resources, and future sources of energy. There are also sections on basic general references, data, and student reading.

"Energy and the Environment" is available at cost, $1.00, from the Environmental Resource Packet Project, Department of Physics and Astronomy, University of Maryland, College Park, Maryland 20742. Contact the project for information on the other packets available.

Energy Crisis: Complex and Complicated

S. David Freeman in "The Energy Crisis: What Makes It So Complex and Complicated?" *Vital Issues*, November 1973, illucidates the components of the energy problem and the components of the solution. After reading the clear descriptions of the components, the reader can readily answer the question included in the title of the article.

Mr. Freeman feels that the public remains confused about the energy problem because its essentially mongrel nature is seldom recognized. Energy is often discussed as if it were solely a question of resources, of how much oil, natural gas, and so on, is left in the ground. Actually the energy crisis is the result of at least four policy areas: economic, foreign, environmental, and resource. The article contains sections on economic, foreign, and environmental policy, with a final section describing the options available for resolving the inherent conflicts within energy politics.

Each one of the energy supply options being promoted today to meet the nation's increased consumption of energy comes attached with an environmental price tag. Thus the unenviable task for us is to decide which energy source is least bad. Mr. Freeman discusses the benefits and detriments of energy sources such as coal, nuclear power, offshore oil, and Middle Eastern oil.

Students and teachers will find this article informative and very readable. To facilitate the use of this article in the classroom and to explore some of the ideas further, a teacher's guide has been developed. The materials are most appropriate for grades 9-12.

The article and the teacher's guide are available from the Center for Information on America, Washington, Connecticut 06793. The teacher's guide is free, and copies of the article are 35 cents each, with quantity rates available.

New Rates for Electricity: Lifeline Service

A coalition of groups in Vermont has developed a novel approach to the process by which a utility company allocates the cost of its operation. The idea is called "Lifeline Service." The idea is simple: every user of electrical energy would receive a fixed number of kilowatt hours at a fixed rate. Users would pay extra for the electricity they used in addition to the fixed amount. The basic reasons for spiraling electric rates are the expensive new plants and the cost of fuels required to meet the ever-increasing demand. This system puts the burden of the rising costs of electricity on those whose rising consumption is contributing so heavily to these high costs.

Lifeline was first pursued by the Vermont Public Interest Research Group (PIRG). They have introduced into the Vermont legislature a bill which proposes adoption of the lifeline system in Vermont. Since December 1973 several PIRGs throughout the country have begun to work on lifeline legislation.

The first PIRG was formed in Oregon in 1970. This year more than 500,000 students on more than 130 campuses are voluntarily supporting PIRG with $1.1 million contributed through student activity fees. PIRGs are operating in 21 states, with thousands of students working part time along with PIRG professional staffs of lawyers, economists, scientists, and organizers.

Information on PIRG's Lifeline Service is available from Citizen Action Group, 133 C Street, S.E., Washington, D.C. 20003. CAG provides a packet of material designed to assist groups in developing and implement-

ing their own lifeline proposal. Even if you are unable to carry out the procedures outlined in the material, the packet would be an invaluable resource for any classroom.

The packet is free and contains the following materials: a summary explaining the importance of Lifeline Service and how it works; a step-by-step outline for calculating a lifeline proposal; an outline of steps citizen groups can take after calculating such a proposal; a copy of the bill introduced to the Vermont legislature and of a petition supporting the concept; information regarding changes in electric rate schedules made by various State Utility Commissions; and an order form for *How to Challenge Your Local Electric Utility*, a book published by the Environmental Action Foundation, 720 Dupont Circle Building, Washington, D.C. 20036. Price: 1-9 copies, $1.50 each; 10-99 copies, $1.00 each; 100 or more copies, $.75 each; copies for profit-making businesses, $10.00 each.

Conservation Foundation Letter

The Conservation Foundation *Letter*, a monthly report on environmental concerns has two recent issues devoted to aspects of the energy problem.

"Making the Best of the Energy Crisis," the theme of the *Letter* of December 1973, focuses on some of the benefits this nation might realize as a result of the energy crisis. This emphasis is not meant to imply that the many serious problems associated with the fuel shortage can be ignored. An awareness of these problems, however, and attempts to solve or alleviate them provide us "a golden opportunity to reexamine our social and personal goals, to reassess our values and our way of life."

There are two ways to alleviate the energy shortage—increase supply and reduce demand. Considerations of the supply problem will bring into sharper focus the potentials of new technology. The development of new technology must be controlled by questions about technological feasibility, costs, safety and environmental damage, and output of net energy. In addition, there are economic, tax, and international policies governing supply that need reappraisal in light of the present bind.

A reduction in demand immediately evokes a response for population control. Further, it reminds us of excessive consumption and waste of energy. There is renewed interest in land use and community planning, with emphasis on developing more self-sufficient, more compact, and more cohesive communities.

"U.S. Coastline Is Scene of Many Energy Conflicts" is the theme of the January 1974 issue of the *Letter*. The nation's coastal zones have felt the development pressures from demands for resorts, second-home communities, mobile-home parks, condominiums, and other commerce. Now they are being pressured to accommodate tanker ports, refineries, nuclear power plants, offshort oil rigs, and associated facilities. The potential damages to marine fisheries and ecosystem, wildlife, access to beaches, open space, recreation and esthetics are well known. So is the nation's need for more energy facilities!

The article goes on to describe some current examples of this conflict and the procedures used to confront it. In addition, there is a list of seven basic policies for judging proposals for development, suggested by Wilma Frey, chairperson of the New England Chapter of the Sierra Club. These policies emphasize environmental protection while at the same time addressing the possible need for economic development.

Both articles contain much valuable information and provide leads for more detailed investigations and discussions. The footnotes in the articles provide an entry to the literature.

Single issues are available from the Conservation Foundation, 1717 Massachusetts Avenue, N.W., Washington, D.C. 20036. Up to 25 copies, 50 cents each; 26-100 copies, 40 cents each; over 100 copies, 30 cents each. There is a discount of 25 percent to teachers and libraries.

Energy, Environment and Education

Under a grant from the Office of Environmental Education, the Conservation Foundation is developing case studies on environmental issues for secondary schools. Three units have been developed and are now being tried out in schools in three different regions of the country.

To assist the Conservation Foundation in identifying topics for the case studies, they conducted three one-day workshops during the summer, 1973, in Lincoln, Massachusetts; Orlando, Florida; and Washington, D.C. The participants in these sessions were environmentalists, high school students, and educators. At the Massachusetts workshop, Paul Swatek of the Massachusetts Audubon Society discussed the energy problem. In the midst of the current energy crisis the Conservation Foundation felt it might be useful to share his comments with educators who are interested in raising some of these issues in schools. A transcript of the presentation and the discussion which followed, together with materials from two other publications, are included in "Energy, Environment and Education: A Working Paper."

The paper provides many ideas and starting points for an exploration of the energy issue. The complex problem of evaluating energy alternatives such as hydropower vs. nuclear vs. fossil fuels is mentioned only briefly, but this might serve as a starting point for a class to have such a debate. Suggestions for further reading on the energy issue are given at the end of the paper.

"Energy, Environment and Education: A Working Paper" is available free from the Conservation Foundation, 1717 Massachusetts Avenue, N.W., Washington, D.C. 20036. Because of a limited supply, teachers are asked to order one copy and duplicate it themselves.

Energy Display System

The Joint Committee on Atomic Energy has developed an energy display system which is most useful for understanding problems as well as the various energy options available for solution to the prob-

lems. Most of the material presented is not new. It is the method of presenting the information that is unique. The system consists of four parts which can be used together or individually. Except where noted, all parts are available from the Center for Strategic and International Studies, Georgetown University, 1800 K Street, N.W., Washington, D.C. 20006.

The Energy Display Model is a series of graphs on transparent Plexiglas showing the U.S. energy demand and supply situation for each decade from 1950 through 1990. The graphs have been made to scale and show the basic energy resources, usable types of energy (such as gas, electricity, etc.), how each kind of energy is consumed, and finally, energy "used" versus energy "lost." The model is designed to give the viewer a rapid understanding of the interrelated factors that constitute our present energy system. For educational or public service institutions, the model is available for $550.00.

A booklet titled "Understanding the National Energy Dilemma" contains substantive background information, printed versions of graphs from the model, plus instructions on assembling the model. From the booklet, which can be used without the model, a person (who is not necessarily an energy specialist) can obtain a reasonable understanding of the broad problems, scale and complexity of our energy dilemma. In addition, one can see some projected future effects of various energy policies on our domestic energy situation. The booklet would be useful as a textbook or discussion guide in "science and public policy" courses. The booklet with the graphs in color is available for $3.95, with discounts on orders of 20 or more. A small black-and-white version of the booklet with the graphs is available free from the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402, Stock No. 5270-01947.

A script and 50 color 35 mm slides cover the basic information in the model and show how it is constructed. The set, however, can be used without having a model. It is available for $15.00.

A nine-piece viewgraphs set with a script allows visual emphasis of specific parts of charts or graphs. It too, can be used without the model. It is available for $175.00.

Energy Conservation in Schools

What the schools can do to help conserve energy is the subject of the December 1973 issue of *A Legal Memorandum*, published by the National Association of Secondary School Principals. Rushing into programs to conserve energy without adequate thought can be self-defeating. The document urges school principals and administrators to ask the right questions before launching an energy conservation program. Twelve possible such questions are listed. Asking such questions will ensure that their schools in fact are conserving energy, not consuming it at a faster rate or endangering the quality of education.

An annual subscription to *A Legal Memorandum* is included in NASSP dues. Single copy price is 25 cents; 5 or more copies, 15 cents each. Copies can be obtained from the National Association of Secondary School Principals, Dulles International Airport, P.O. Box 17430, Washington, D.C. 20041.

Power-Saving Guide

"Watts Going on Where You Live?" is a recent publication of the General Electric Company. Its purpose is to serve as a power-saving guide and it contains 100 energy-saving hints. The booklet is nicely illustrated with human-looking home appliances, sometimes verging on the grotesque. The guides are clear and direct and should be of interest to young people. These booklets are sold in packages of 50 at 10 cents a copy. Write to General Electric Company, P. O. Box 500, New Concord, Ohio 43762, for further information.—Abstracted from *The Consumer Educator*, Vol. 3, No. 4, January 1974.

Energy Publications from AAAS

The American Association for the Advancement of Science has several publications on the energy issue. Together the items provide a wealth of information on all aspects of the energy issue, but each item is a self-contained unit which can be used alone.

Energy and the Future, a new and authoritative AAAS book, takes a long-range look at energy. Based in part on the energy series in *Science*, this book surveys current and future sources of energy and describes the relevant technologies. It also assesses their potential environmental problems and identifies the technical obstacles to their development. The broad scope and balanced perspective of *Energy and the Future* make it a valuable resource for anyone wishing to explore the scientific and technological basis of the energy dilemma. The paperbound version is $4.95 ($4.45 members' price) and the casebound version is $9.95 ($8.95 members' price).

Energy: A Dialogue is a series of 12 audiotapes dealing in depth with the energy dilemmas we now face in the United States. They were created from long hours of interviews with people in this country who know about the energy problem. The series focuses on three major themes: the energy crisis, what it is and how it got that way; the technological options and their relative merits; and the interrelationship of energy with life styles, environment, population, resources, trade policy, politics, and family budget. The tapes are $49.95 ($39.96 members' price).

Energy: A Glossary is the glossary from the book *Energy and the Future*. The glossary provides definitions for some of the most commonly encountered terms used in discussing energy. In addition to a general definition, there is a description of how the term is used in the context of energy. The definitions should provide a brief introduction to most of the key concepts of energy technology. The glossary is available for $1.00.

Science magazine, April 19, 1974, is completely devoted to the energy issue. Topics covered are: conservation in homes, schools, and industry; solar energy; sociological impact of energy crisis; economic strategy; geothermal electricity; impact on balance of payments;

federal energy policy; academic community involvement; expanding utilization of coal; expanded oil production; energy research and development; the European view; low cost energy; nuclear energy; oil from shale; and more. Many topics relevant to the energy problem were omitted from this issue of *Science* because they had already been treated in recent issues of the magazine. A list of these articles and the date of publication is included in the April 19 issue. The energy issue of *Science* is available for $1.00 each (1 to 4 copies); 80 cents each (5 or more copies); 70 cents each (25 or more copies).

These publications can be ordered from the American Association for the Advancement of Science, Dept. EI, 1515 Massachusetts Avenue, N.W., Washington, D.C. 20005.

Announcements

Center for Science in the Public Interest

The Center for Science in the Public Interest, 1779 Church Street, N.W., Washington, D.C. 20036, has several publications aimed at increasing the knowledge base of citizens in scientific and technological matters. Several of the publications treat issues directly related to the energy crisis.

Each publication is valuable because it presents information never before available from one source. In addition to presenting data, each publication contains a section summarizing the data and a section recommending government and citizen action necessary for meeting the needs implied by the data.

Gasoline is a citizen's guide to current problems dealing with gasoline safety, regulation, environmental effects and purchase. Valuable data are presented in areas such as components of gasoline, gasoline additives, cost of environmental controls, and lead in gasoline. ($2.00.)

Big Oil: A Citizen's Factbook on the Major Oil Companies lists major oil assets, salaries of top executives, locations and capacities of refineries, plans for refinery expansions, and some indication of the extent of domestic and foreign operations. ($3.00.)

Interlocking Oil: Big Oil Ties with Other Corporations lists for each major oil company the directors who serve on boards of other institutions. The other institutions are also named. ($4.00.)

A publication on shale oil will be available in the summer of 1974.

Discounts may be available for large orders on request.

National Academy of Sciences

The National Academy of Sciences has many publications related to energy. Some examples are: *Impact of Air Pollution Regulations on Fuel Selection for Federal Facilities*, $2.95; *Engineering for Resolution of the Energy-Environment Dilemma*, $10.50; *Transportation and the Prospects for Improved Efficiency*, $7.00.

For information on these and other publications, write National Academy of Sciences, Printing and Publishing Office, 2101 Constitution Avenue, N.W., Washington, D.C. 20418.

Summer Workshop and Inservice Seminar

The William Paterson College of New Jersey will offer a summer workshop course, "For Teachers: Our Ecology, Energy Conservation and the Energy Crisis," from July 1 to August 8, 1974. The workshop is for employed teachers and other professionals. It will offer six graduate credit hours for those who complete the course requirements satisfactorily. The applicants will be selected in teams of two from each teaching district or major-sized school. One in each team will be a teacher of social sciences, the other will be a teacher of the natural sciences. These two will work as a team developing an interdisciplinary environmental energy unit and curriculum for their school system, as well as an environmental community research project. The teachers will be able to benefit from the expertise of media and library retrieval specialists, as well as distinguished consultant-teachers.

The workshop will be followed by an Inservice Training Seminar for teachers, which will meet every other Saturday morning for three hours from September 1974 to June 1975. This seminar offers three graduate credit hours for those who complete the requirements satisfactorily. In the seminar each secondary school teacher will present for group evaluation and improvement an

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environmental community research project and/or an adult education community program in energy resources, uses, and conservation that had been begun as one of the major requirements of the summer workshop. Materials developed will be available for inservice training of other school personnel as well as to any school system wishing to initiate energy courses of their own.

For more information about these two programs, including tuition and fee arrangements, write Jonas Zweig, Director of Summer Workshop and Inservice Training Seminar, Secondary Education Department, Raubinger Room 423, William Paterson College of New Jersey, Wayne, New Jersey 07470.

Radio Program

The Division of Natural Sciences and Mathematics, Mercyhurst College, is producing a weekly half-hour program entitled "Entropy." The radio series, which began January 27, 1974, deals with the impact of the energy crisis on the Erie, Pennsylvania, area. The half-hour programs are panel discussions of the effects of heating and air conditioning, electricity, nuclear power, new forms of energy, transportation, manufacturing, and tourism. A staff member from the college interviews a panel of two to four experts from industry during each program. The programs have been taped and the cassette tapes are available at cost. For further information contact Sister Mary Charles Weschler, Chairman, Division of Natural Sciences and Mathematics, Mercyhurst College, 501 East 38 Street, Glenwood hills, Erie, Pennsylvania 16501.

Audio-Tutorial Conference

The sixth annual conference of the International Audio-Tutorial Congress will be held on November 6, 7, and 8, 1974, and the A-T Workshop on November 9, at Holiday Golden Gate, San Francisco, California. For information write to Dr. John Hinton, Cabrillo College, 6500 Soquel Drive, Aptos, California 95003. Anyone wishing to submit a paper should send two typed copies of an abstract in final form to Dr. David D. Husband, Department of Biology, University of South Carolina, Columbia, South Carolina 29208. The abstract must be limited to one page and should give the title and the author(s) and their addresses. Copies of all abstracts received by September 20 will be distributed to each participant at the conference. Those chosen to present their papers will be notified by October 1.

International Education Conference

The Institute of Electrical and Electronics Engineers is holding an International Conference on Frontiers in Education at University College, London, July 15-19, 1974. Among the cosponsors of the conference are the British Broadcasting Corporation and the Open University. The theme of the conference is the application of educational technology to the improvement of the process of learning. Information about the conference can be obtained from the IEE Conference Department, Savoy, London WC2R OBL, England.

Films

BFA Educational Media offers three 16 mm films to help students become informed about the energy subject. *Energy*, in vivid color and action, shows how matter is affected by movements of other matter. This film develops an awareness of the universal role played by energy in physical processes. *Energy to Burn*, a film produced for the Biological Sciences Curriculum Study, shows how we use and misuse our energy resources. This film is designed to promote discussion about energy sources and energy uses. Although not directly related to energy use, the BSCS film, *Tragedy of the Commons*, defines one of the major obstacles to solution of general problems. Too often, problems that need the help of everyone end up the specific responsibility of no one. This film shows how this principle works to our destruction using the setting of the English cattle lands.

For information about these films write BFA Educational Media, 211 Michigan Avenue, Santa Monica, California 90404.

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